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3 **APPLICATION**

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5 **UNITED STATES LETTERS PATENT**

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7 *by*

8 **QING LIN ZHU**

9  
10 *on the invention entitled*

11 **MODULAR FENCE**

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# MODULAR FENCE

This Patent Application is a continuation in-part of Patent Application Serial No. 10/087,258 filed on March 1, 2002, now pending.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates generally to the field of fences. More particularly, the present invention relates to the field of modular picket fences.

### 2. Description of the Prior Art

Specifically, prior art wrought iron fences are well known in the art. These prior art wrought iron fences have become especially popular in recent years as protective fencing around swimming pools, gardens and serve as security barriers around patios and entryways. The wrought iron fences are formed from rods or tubes of metal which are welded to upper and lower rails to form panels or sections. The panels are either welded between upright metal posts or bolted to the upright posts. The iron fences are sturdy but have a number of problems such as the welded areas are susceptible to rusting even when painted and if galvanized components are used the welding destroys the coating at the welded area that leads to rust. The wrought iron fences are usually assembled and joined together at the job site and required considerable skill and time on the part of the professional artisans. For this reason, they are relatively expensive.

1       The following six (6) prior art patents are found to be pertinent to the field  
2 of the present invention:

- 3  
4       1.     United States Patent No. 1,664,080 issued to Mapson on May 6, 1926  
5             for "Ornamental Iron Stair Rail Structure" (hereafter "*Mapson*");  
6
- 7       2.     United States Patent No. 3,067,985 issued to Cusack on  
8             March 29, 1961 for "Picket Fence" (hereafter "*Cusack*");  
9
- 10      3.     United States Patent No. 5,150,885 issued to Leone on  
11             September 29, 1992 for "Picket Fence Assembly" (hereafter "*Leone*");  
12
- 13      4.     United States Patent No. 5,443,244 issued to Gibbs on  
14             August 22, 1995 for "Rolled Metal Pence Rail" (hereafter "*Gibbs*");  
15
- 16      5.     United States Patent No. 5,882,001 issued to Reinbold on  
17             March 16, 1999 for "Modular Fence Structure" (hereafter  
18             "*Reinbold*"); and  
19
- 20      6.     United States Patent No. 6,053,481 issued to Scheide on  
21             April 25, 2000 for "Security Fence Rail Bracket" (hereafter  
22             "*Scheide*").  
23

24       *Mapson* discloses an ornamental iron stair rail structure with means of  
25 securing the separate members of the side railing of stairs together.  
26

27       *Cusack* discloses a modular picket fence having horizontal rails and vertical  
28 pickets interconnected by a plurality of bolt and nut sets. However, each bolts and

1 nuts set (40, 42 and 44) must be separately and individually fastened, which is very  
2 laborious and time consuming.

3  
4 *Leone* discloses a picket fence assembly which comprises an upper rail, a  
5 lower rail and a plurality of vertically disposed pickets. Each rail has a plurality of  
6 non-circular apertures that extend therethrough in substantial vertical alignment.  
7 Each picket extends through one of the apertures in the upper rail and through one  
8 of the aligned apertures in the lower rail. The pickets have upper and lower  
9 indentations for engaging the upper and lower rails. The pickets are respectively  
10 held in the apertures and are axially movable in the apertures to a locking position  
11 at which the indentations in the pickets are engaged by the rails and axial  
12 movement of the pickets relative to the rails is prevented. The rails are provided  
13 with a frictional locking means, such that the pickets are engaged in a frictional fit  
14 therewith in the locking position wherein rotational movement of the pickets is  
15 restrained. The frictional locking means comprises a plurality of paired opposed  
16 indentations in the flanges of the rails. The indentations conform with the  
17 perimeter configuration of the pickets in the locking position.

18  
19 *Gibbs* discloses a rolled metal rail that is incorporated into a picket fence  
20 which utilizes multiple such rails.

21  
22 *Reinbold* discloses a modular fence structure which includes a plurality of  
23 posts having vertically spaced ribs on confronting surfaces for supporting the  
24 respective end portion of inverted U-shaped rails. The rails have a plurality of  
25 longitudinally equally spaced vertically aligned apertures with each aperture  
26 having a tab portion of the U-shaped rail bight portion projecting into the aperture.  
27 A plurality of pickets are cooperatively received by the respective aligned  
28 apertures with each picket having a pair of transverse longitudinally spaced slots in

1 its wall cooperatively nesting a respective tab projecting into each slot.

2 An inverted L-shaped spring clip enters the respective aperture on that side of the  
3 post opposite its slot to engage upper and lower surfaces of the bight portion of the  
4 respective rail adjacent the aperture and lock the respective picket against  
5 movement relative to the rails.

6  
7 *Scheide* discloses a security fence rail bracket for supporting a fence rail  
8 which includes a hollow body with an open-topped cavity and an end wall with a  
9 cross-shaped aperture through which a bolt is passed into a fence post. The  
10 angularity of the body with respect to the post surface is adjusted by installing one  
11 or more tapered spacers between the body and the post. The spacers have nesting  
12 bosses and recesses, and offset slots through which the bolt passes.

13  
14 It is desirable to provide a modular picket fence which may be formed from  
15 metal or other materials and easily and conveniently assembled on the job site by  
16 a professional or homeowner. It is also desirable to provide a modular picket fence  
17 which includes separate interconnecting modular parts that can be assembled  
18 together without any welding or using special tools or equipment, thereby reducing  
19 costs and lowering assembled labor.

## SUMMARY OF THE INVENTION

The present invention is a unique modular picket fence.

The modular picket fence comprises a pair of vertical posts positioned at suitable distance and adapted to be secured to a suitable support surface. At least one horizontal upper and lower rails extend between and secured to the vertical posts. The horizontal upper rail has a plurality of vertical apertures which are substantially aligned with a plurality of vertical apertures on the horizontal lower rail. A plurality of vertical pickets are respectively inserted through the vertical apertures of the upper rail and through aligned vertical apertures of the lower rail. Each picket has at least two transverse locking slotted apertures for respectively receiving a H-shaped locking clip to secure the picket to the rail.

It is an object of the present invention to provide a modular picket fence which has a decorative and functional enclosure for any physical area formed from modular components permitting a complete customized fencing section which may be erected at the installation site, preferably from prefabricated metallic material.

It is an additional object of the present invention to provide a modular picket fence in the form that may be readily assembled from a set of modular components by a person or homeowner of ordinary skill and experience without the use of welding equipment or other special tools.

It is a further object of the present invention to provide a modular picket fence which the manufactured components are reduced to a small number of very simple and inexpensive components.

1           It is a further object of the present invention to provide a modular picket  
2 fence which includes an insertable locking means that engages the picket and rail  
3 for precluding vertical movement of the pickets with respect to the rails.

4  
5           Further novel features and other objects of the present invention will become  
6 apparent from the following detailed description, discussion and the appended  
7 claims, taken in conjunction with the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Referring particularly to the drawings for the purpose of illustration only and not limitation, there is illustrated:

FIG. 1 is a perspective view of the preferred embodiment of a fully assembled modular picket fence in accordance with the present invention;

FIG. 2 is an enlarged exploded perspective view of the present invention modular picket fence shown in FIG. 1;

FIG. 3 is a partial enlarged exploded perspective view of an alternative embodiment of the present invention modular picket fence shown in FIG. 1;

FIG. 4 is an enlarged perspective view of one of the plurality of H-shaped locking clips in accordance with the present invention;

FIG. 5(a) is a plan view of a preferred embodiment of a locking slotted aperture in accordance with the present invention;

FIG. 5(b) is a plan view of an alternative embodiment of a locking slotted aperture in accordance with the present invention;

FIG. 5(c) is a plan view of still another alternative embodiment of a locking slotted aperture in accordance with the present invention;

FIGs. 6(a) through 6(e) illustrates how the modular picket fence is assembled in accordance with the present invention;



1        FIG. 6(f) is a side elevational view of another arrangement of the modular  
2 picket fence in accordance with the present invention;

3  
4        FIG. 6(g) is a side elevational view of a further arrangement of the modular  
5 picket fence in accordance with the present invention;

6  
7        FIG. 7 is a perspective view of another alternative embodiment of a fully  
8 assembled modular picket fence in accordance with the present invention;

9  
10       FIG. 8 is an exploded partial perspective view of the alternative embodiment  
11 of the present invention modular picket fence;

12  
13       FIG. 9(a) is a partial perspective view of the top portion of a picket used in  
14 the alternative embodiment of the present invention modular picket fence;

15  
16       FIG. 9(b) is a partial perspective view of the top portion of a picket with  
17 a spring clip assembled therein;

18  
19       FIG. 10(a) is a perspective view of one of the preferred embodiments of the  
20 spring clip used in the alternative embodiment of the present invention modular  
21 picket fence;

22  
23       FIG. 10(b) is a side elevational view of another preferred embodiment of the  
24 present invention spring clip;

25  
26       FIG. 10(c) is a side elevational view of still another preferred embodiment of  
27 the present invention spring clip;

1        FIG. 10(d) is a side elevational view of still another preferred embodiment  
2 of the present invention spring clip;

3  
4        FIG. 10(e) is a side elevational view of still another preferred embodiment of  
5 the present invention spring clip;

6  
7        FIG. 11 is a cross-sectional side view of an alternative embodiment of the  
8 present invention spring clip; and

9  
10       FIG. 12 is a perspective view of one of the preferred embodiments of the  
11 sealing cap used in the alternative embodiment of the present invention modular  
12 picket fence.

## 1       **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

2  
3       Although specific embodiments of the present invention will now be  
4 described with reference to the drawings, it should be understood that such  
5 embodiments are by way of example only and merely illustrative of but a small  
6 number of the many possible specific embodiments which can represent  
7 applications of the principles of the present invention. Various changes and  
8 modifications obvious to one skilled in the art to which the present invention  
9 pertains are deemed to be within the spirit, scope and contemplation of the present  
10 invention as further defined in the appended claims.

11  
12       Described briefly, the present invention is a modular picket fence. In the  
13 first arrangement of the present invention, the modular picket fence may be  
14 assembled with a pair of horizontal upper rails and one horizontal lower rail as  
15 shown in Figures 1, 2, 6(f), and 6(g). In the second arrangement of the present  
16 invention, the modular picket fence may be assembled with at least one horizontal  
17 upper rail and at least one horizontal lower rail as shown in Figures 6(a)-6(e).

18  
19       Referring to Figure 1, there is shown at 10 a first arrangement of the present  
20 invention modular picket fence which comprises a pair of hollow vertical posts or  
21 columns 12 and 14 usually spaced apart approximately 6-8 feet and positioned to  
22 be secured to a support surface or any other suitable surface, a plurality of hollow  
23 vertically disposed pickets or poles 16, a pair of spaced apart elongated hollow  
24 horizontal upper rails 18 and 20, and an elongated hollow horizontal lower rail 22.  
25 In the example shown, the posts 12 and 14 are square shaped tubular but obviously  
26 may be of other cross-sectional configuration as desired.

27  
28       For clarity purposes, only three vertical pickets 16 are illustrated. It will be

1 appreciated that the vertical pickets 16 are not limited to the number of pickets  
2 illustrated in Figure 1. It is emphasized that while the three vertical pickets are  
3 depicted, it is also within the spirit and scope of the present invention to have a  
4 plurality of vertical pickets which can be used as shown in Figures 6(b)-6(g). It  
5 will also be appreciated that at least one elongated horizontal upper rail 18 and at  
6 least one elongated horizontal lower rail 22 can be used with the present invention  
7 modular fence assembly as shown in Figures 6(a)-6(e).

8  
9 Referring to Figures 1 and 2, each of the vertical posts 12 and 14 are  
10 substantially identical, and to the extent they are, only one will be described in  
11 detail in the interest of brevity. At least three U-shaped metal brackets 50 are  
12 attached to the post 12 and located at three different locations along the length of  
13 the post 12, where the brackets 50 of each post face each other as shown in Figure  
14 1. Each bracket 50 is held against the inner wall or surface of the post 12 by at  
15 least two screws fasteners 52 which are threadedly engaged to the bracket 50 and  
16 the post 12. As depicted in Figure 2, the ends of the rails 18, 20 and 22 are  
17 removably attached between the posts 12 and 14 by the U-shaped metal brackets  
18 50, which receive and retain the rails thereto by using bolts 54 and nuts 56. Each  
19 bolt 54 is inserted through the hole 58 on one side of the bracket 50 and then  
20 inserted through a slotted adjustment aperture 62 of the rail for allowing a  
21 horizontal adjustment of the rails. An ornamental cover or cap 60 is inserted in the  
22 upper end of the vertical post 12 for decorative and sealing purposes.

23  
24 Each of the horizontal rails 18, 20 and 22 are substantially identical, and to  
25 the extend they are, only one will be described in detail in the interest of brevity.  
26 The rail 18 has a plurality of longitudinally equally spaced apart vertically aligned  
27 non-circular apertures 30, preferably four-sided apertures for receiving the  
28 plurality of non-circular pickets 16, preferably four-sided pickets. The non-

1 circular apertures 30 are being of shape and size equal to the cross sectional shape  
2 and size of the pickets 16 such that the pickets 16 may be inserted therethrough.  
3 The rail 18 also has two slotted apertures 62 extending through the side of rail and  
4 located at opposite ends.

5  
6 As shown in Figures 1 and 2, there are provided ornamental caps 24 for each  
7 aperture 30 on the rails 18, 20 and 22, and which is slidable on the picket 16 to  
8 position the ornamental cap 24 for covering and sealing the aperture 30 when the  
9 pickets 16 are in a locking position. The pickets 16 have a uniform square  
10 cross-section and have at least one transverse upper locking slotted aperture 32 and  
11 at least one transverse lower locking slotted aperture 34 extending therethrough  
12 (see Figure 3) and located along the length of the picket 16 and cooperating with  
13 the rails 18 and 22 for precluding movement of the pickets 16 with respect to the  
14 rails 18, 20 and 22. The upper and lower locking slotted apertures 32 and 34 are  
15 generally rectangular shape as shown in Figure 5(a). Each picket 16 is held in  
16 position by at least two H-shaped locking clips or means 40 (see Figure 3).

17  
18 It will be appreciated that the upper and lower locking slotted apertures 32  
19 and 34 are not limited to the rectangular shape illustrated in Figure 5(a). It is  
20 emphasized that while the rectangular shape of the locking slotted aperture is  
21 preferred, it is also within the spirit and scope of the present invention to have  
22 a plurality of different shapes for the locking slotted apertures as shown in Figures  
23 5(b) and 5(c).

24  
25 Referring to Figures 3 and 4, there is shown the H-shaped locking clip or  
26 means 40 that includes a middle section 42 and two leg sections 44 which are  
27 formed at opposite ends of the middle section 42. The middle section 42 and the  
28 two leg sections 44 form four separate recesses 46 at locations where the middle

1 section 42 and the two leg sections 44 are connected together. The H-shaped  
2 locking clip 40 is installed by having one of the leg sections 44 inserted into the  
3 locking slotted aperture, where the middle section 42 is concealed within the  
4 locking slotted aperture and the two leg sections are outside of the slotted aperture  
5 as shown in Figure 3.

6  
7 Referring to Figures 6(a)-6(e), in order to assemble the modular fence 10,  
8 the two vertical posts 12 and 14 are positioned at remote locations, where the  
9 brackets 50 of each post face each other as shown in Figure 6(a). The pickets 16  
10 are respectively inserted through the apertures 30 in the upper rail 18 and then  
11 inserted through the apertures 30 in the lower rail 22 as shown in Figure 6(b). The  
12 pickets 16 are thereby in the assembly position as shown. The ends of the upper  
13 rail 18 are then attached to the bracket 50 of each post as shown. Each H-shaped  
14 locking clip 40 is respectively inserted into each upper and lower locking slotted  
15 apertures 32 and 34 of each picket 16 as shown in Figures 6(c) and 6(d), where the  
16 middle section 42 is located within the slotted locking aperture while the leg  
17 sections 44 are located external to the picket 16 as shown in Figure 3. The upper  
18 H-shaped locking clips 40 engage against the upper surface or wall of the upper  
19 rail 18 (see Figure 6(c)) while the lower H-shaped locking clips 40 engage against  
20 the lower surface or wall of the lower rail 22. The ends of the lower rail 22 are  
21 then attached to the bracket 50 of each post to provide a finish product as shown in  
22 Figure 6(e).

23  
24 In the locking position, the H-shaped locking clips 40 frictionally abut the  
25 exterior walls of the rails, thereby preventing vertical displacement of the pickets  
26 16. Once the pickets 16 are in the locking position, ornamental caps 24 are pushed  
27 downwardly such that the ornamental caps 24 are respectively inserted into the  
28 apertures 30 to form a tight smooth joint between picket and rail, thereby further

1 preventing picket displacement, and preventing erosion of the joint through  
2 environmental wear and tear. Each picket is inserted and locked into place in the  
3 same manner.

4  
5 The present invention may further include ornaments 80 which can be used  
6 with the first arrangement of the present invention. These ornaments 80 are  
7 attached to and between the pair of horizontal upper rails 18 and 20 as shown in  
8 Figures 1, 2 and 6(g) for decorative purposes.

9  
10 Referring to Figure 6(f), in this arrangement of the present invention, the  
11 modular picket fence is assembled as shown in Figure 3.

12  
13 The modular fence further includes bolts and nuts, where each bolt is  
14 inserted through a respective horizontal rail and picket for further securing the  
15 pickets to the rails.

16  
17 The present invention conforms to conventional forms of manufacture or  
18 any other conventional way known to one skilled in the art.

19  
20 Referring to Figure 7, there is shown at 110 another alternative embodiment  
21 of the present invention modular picket fence. This alternative embodiment of the  
22 present invention modular picket fence 110 comprises a pair of hollow vertical  
23 posts or columns 112 and 114 positioned to be secured to a support surface or any  
24 other suitable surface, a plurality of hollow vertically disposed pickets or poles  
25 116, and a pair of spaced apart elongated hollow horizontal rails 118. In this  
26 example shown, the posts 112, 114, the pickets 116, and the rails 118 each has a  
27 square or rectangular shaped cross section configuration, but obviously may be of  
28 other cross-sectional configuration as desired.

1 In addition, for clarity purposes, only three vertical pickets 116 are shown.  
2 It will be appreciated that the vertical pickets 116 are not limited to the number of  
3 pickets illustrated in Figure 7. It is emphasized that while three vertical pickets  
4 116 are depicted, it is also within the spirit and scope of the present invention to  
5 have greater or smaller number of vertical pickets 116.  
6

7 Referring to Figures 7 and 8, each of the vertical posts 112 and 114 are  
8 substantially identical, and to the extent they are, only one will be described in  
9 detail in the interest of brevity. A U-shaped metal brackets 120 is attached to the  
10 post 112 by screws 122 for removably attaching the proximal end of rail 118 by  
11 fastening bolts 124 and nuts 126 through the holes 128 on the U-shaped bracket  
12 150 and also through the slotted aperture 159 at the proximal end of the rail 118.  
13

14 Each of the horizontal rails 118 and 120 are substantially identical, and to  
15 the extend they are, only one will be described in detail in the interest of brevity.  
16 The rail 118 has a plurality of non-circular apertures 130, preferably four-sided  
17 apertures for receiving the plurality of pickets 116, preferably four-sided pickets.  
18

19 As shown in Figures 8 and 12, there are provided sealing caps 124 for each  
20 aperture 130 on the rails 118 and which is slidable on the picket 116 to position the  
21 sealing cap 124 for covering and sealing the aperture 130 after the pickets 116 are  
22 assembled.  
23

24 As shown in Figures 8, 9(a), 9(b) and 10, at the end portion of each picket  
25 116 there is provided two oppositely aligned transverse apertures 134 each having  
26 a locking tongue 135. A generally reversed U or V-shaped spring clip 140 is  
27 inserted at the end portion of the picket 116.  
28



1       The spring clip 140 may be made of metal or other suitable material with  
2 a memory to return to its pre-deformed shape after being compressed or squeezed.  
3 The spring clip 140 has a generally reversed U or V-shaped configuration with a  
4 bent middle portion 142 and two opposite end portions where there are provided  
5 outwardly protruding stoppers 142 which, when the spring clip 140 is inserted into  
6 the end portion of picket 116, will extend outwardly through the transverse  
7 apertures 134 thereof. Each stopper 142 has an opening 145 which receives the  
8 locking tongue 135 of the picket 116, thereby preventing movement of the spring  
9 clip 140 inside the picket 116.

10  
11       Each stopper 142 of the spring clip 140 has a ramp side 147 and a right-  
12 angle side 149. As the end portion of the picket 116 (with the spring clip 140  
13 inserted) is inserted through the aperture 130 of the rail 118, the ramp side 147 of  
14 the spring clip 140 will engage with the edges of the aperture 130 of the rail 118  
15 first, causing the spring clip 140 to be compressed, thereby allowing end portion of  
16 the picket 116 to be inserted further through the aperture 130.

17  
18       Once the ramp side 147 of the spring clip 140 passes the edges of the  
19 aperture 130 of the rail 118, the spring clip 140 will expand back, causing the  
20 right-angle side 149 of the spring clip 140 to engage and rest upon the interior  
21 surface of the hollow rail 118 (as shown in Figure 8).

22  
23       Once the stoppers 144 of the spring clip snap in place inside the aperture 130  
24 of the rail 118, the end portion of the picket 116 is locked therein and cannot be  
25 removed. This mechanism secures the picket 116 to the rail 118.

26  
27       Other similar embodiments of the present invention spring clip are shown in  
28 Figures 10(b)-10(e).

1       An alternative embodiment of the present invention spring clip is shown in  
2 Figure 11. In this alternative embodiment, spring clip 150 includes a hollow block  
3 152 which is inserted into the end portion of a picket 160. Two oppositely  
4 disposed stoppers 154 are assembled inside the clip 150 and biased by an internal  
5 spring 156. The stoppers 154 are extending through corresponding openings 162  
6 at the end portions of the picket 160. The stoppers 154 can be compressed  
7 inwardly to allow the end portion of the picket 160 to be inserted into the aperture  
8 130 of the rail 118. Once inside the rail 118, the stoppers 154 will extend back,  
9 which secures the end portion of the picket 160 to the rail 118.

10  
11       Of course the present invention is not intended to be restricted to any  
12 particular form or arrangement, or any specific embodiment, or any specific use,  
13 disclosed herein, since the same may be modified in various particulars or relations  
14 without departing from the spirit or scope of the claimed invention hereinabove  
15 shown and described of which the apparatus or method shown is intended only for  
16 illustration and disclosure of an operative embodiment and not to show all of the  
17 various forms or modifications in which this invention might be embodied or  
18 operated.

19  
20       The present invention has been described in considerable detail in order to  
21 comply with the patent laws by providing full public disclosure of at least one of  
22 its forms. However, such detailed description is not intended in any way to limit  
23 the broad features or principles of the present invention, or the scope of the patent  
24 to be granted. Therefore, the invention is to be limited only by the scope of the  
25 appended claims.

26  
27       **WHAT IS CLAIMED IS:**  
28